Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-048

Proposal Title: Turtle Island Skywatchers – Minnesota Research and Data Visualization

Project Manager Information

Name: Annette S. Lee

Organization: Native Skywatchers Inc

Office Telephone: (612) 314-9717

Email: nativeskywatchers@gmail.com

Project Basic Information

Project Summary: Turtle Island Skywatchers - Innovative Research and Data Visualization project works to protect Minnesota water, wildlife, and natural resources while empowering Indigenous youth as leaders and all citizens as researchers.

Funds Requested: $200,000

Proposed Project Completion: June 30, 2026

LCCMR Funding Category: Small Projects (H)

Secondary Category: Foundational Natural Resource Data and Information (A)

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

The Native Skywatchers research and programming initiative has been recording, mapping, and sharing Indigenous sky and earth place-based knowledge for sixteen years. From NASA to Fond du Lac Tribal College to the Minnesota Department of Education, the Native Skywatchers Summer Workshops for Educators, has decades of experience at the forefront of working at the intersection of science, culture, and art for the benefit of all. Native Skywatchers has served over 300,000 people and continues as a leader in Indigenous science methodology and research with long-term broad impacts.

This project, "Turtle Island Skywatchers", is an expanded version of existing successful programming called "We are Stardust" and its related branch, "Ocean Voices-Sea and Stars". Support from the LCCMR trust fund would allow Native Skywatchers to three additional MN-based cohorts of underrepresented students to experience cutting-edge research that gets them out into the Minnesota wild. Youth engage with authentic data and scientific tools. Citizens participate.

Each national park has a unique soundscape, made up of a distinct blend of animals, human, and physical sound sources. Recent investigations have documented that turtles, and many understudied species previously believed to be mute, communicate with diverse sounds which can be used to study their behavior.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

Turtles are of great importance to many Indigenous traditions. Recent investigations have documented that turtles, and many understudied species previously believed to be mute, communicate with diverse sounds. Paired visual and acoustic recordings are essential data collection methods to document this behavior.

This is a three-fold science research-based project at the intersection of research and community.
(1) Collect images and acoustic data from turtles and their habitats, analyze the data, and explore research questions.
(2) Data visualization of Minnesota place-based animals especially related to Indigenous constellations, climate crisis, and environmental stewardship.
(3) Engage residents of Minnesota in a citizen science research-based call to action. Raw data collected by our team will be streamlined into an easy-to-participate online initiative.

Students will participate in co-learning cohorts that start with a research project and expand into three critical components: science, culture, and art. The deep dive into science will include investigations, data collection, and analysis on endangered species of turtles in Minnesota such as the Blandling's turtle. The science research will include data acquisition, information management, and analysis. Research, monitoring, and evaluation to increase protection and understand contaminants of terrestrial and aquatic species will be important. This work is critical and urgently needed.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

By connecting Indigenous youth, science research, and cultural knowledge, Native Skywatchers works to revitalize our relationships to earth and sky, and water. This participatory relationship is based on environmental stewardship which is embedded in our Indigenous Knowledge System thinking. Specific project outcomes are:

- Document acoustic repertoire of turtles
- Characterize patterns in acoustic behavior of turtles and other species important to Indigenous constellations
- Evaluate differences in soundscapes and acoustic behavior between urban and protected, wilderness habitats
- Redefine a research group by including professional scientists, Indigenous knowledge holders, students,

teachers, and citizen scientists of Minnesota.

- Disseminate findings

Activities and Milestones

Activity 1: Turtle Research – Environmental Stewardship through Acoustic Data Collection & Analysis

Activity Budget: $100,000

Activity Description:
Primary Research Objective: Evaluate turtle acoustic behavior in the context of different human impacts.
Just as Galileo turned his telescope to the heavens, we are turning our ears to Minnesota waterways to use new methods to listen to what lies beneath the surface. The study of sound in nature is inherently interdisciplinary and includes considerations of ecology, physics, climate, and human activity. Our approach will merge ideas to support the exploration of underwater habitats and document sounds that have never been heard by human ears. We will deploy paired autonomous acoustic recorders and motion-activated camera traps in both urban and undisturbed turtle habitats which will record continuously over longer durations (e.g. 1 week - 1 month). Acoustic recorders can be deployed in terrestrial or aquatic habitats; however, camera traps will not be used for underwater recordings. Field sites will be (1) Voyageurs National Park, and (2) Mississippi National River and Recreation Area, specific sites will be chosen based on the presence of species of interest (e.g. protected or culturally significant animals). Data will be used to compare species' presence in different habitats (e.g. urban vs. forested) and to investigate patterns related to daily, lunar, and seasonal cycles.

Activity Milestones:

Description	Approximate Completion Date
Data Collection - Deploy acoustic recorders and camera traps with Native Skywatchers National Teen Ambassador	July 31, 2024
Continued Data Collection Mississippi River Area and Planning Meetings for Fall cohorts	September 30, 2024
Data Analysis - Turtle Island Skywatchers youth researchers analyze acoustic data with active researchers	May 31, 2025
Continued Cohorts - Youth research teams, Peer mentors train new youth researchers, Sustainable model achieved	July 31, 2025
Formative and Summative Evaluation; Reflection and Progress on Outcome Inventory	June 30, 2026

Activity 2: Scientific Storytelling – Mapping Scientific Data with Cultural Stories that Inspire Stewardship

Activity Budget: $60,000

Activity Description:
Native Skywatchers has a proven record of leading interdisciplinary co-learning cohorts that bring together science, culture, and art. Our framework is called 'Two-Eyed Seeing'. It means to honor the Western way of knowing with one eye and Indigenous way of knowing with the other eye but to see with both eyes for the benefit of all" (Marshall 2012). The gift of multiple perspectives is key.

The focus of this Activity is to support a deep dive into scientific storytelling based on existing datasets and maps like USGS Water Quality and MN Pollution Control Agency. Ojibwe and Dakota Star Maps feature native Minnesota wildlife and place-based teachings. Stewardship is embedded. We will create land and water story maps that speak to the paired relationship 'As it is Above, It is Below' or Kapemni (in Dakota). Interconnectedness. For example, Keya is the Turtle constellation in Dakota. We can build a story map connecting the celestial and the terrestrial that asks questions, raises curiosity, and ignites wonder... where are turtles located, what are impacts due to contaminants in water, how might habitat be threatened by climate change. Other culturally relevant animals are wolves, moose, eagles, loons, mountain lions, cranes, bears... Maps come alive!

Activity Milestones:

Description	Approximate Completion Date
Research and Preproduction-Finalize Visual Experience Strategy based on existing Datasets, Maps, Surveys, LiDAR	September 30, 2024
Create Sample Story Maps - Used to share with cohorts. Resource and Model Design Process	December 31, 2024
Create Visuals and Audio: Storyboards & Scripts for Story Mapping Animations, Communicate the Science & the Awe	June 30, 2025
Sound Design & Production Boards: Using in part Field recordings & journals from students, Create Animated Infographic	December 31, 2025
Advanced Composting & Final Multimedia Product: Final Production of Animation Shorts- Story Maps Statewide Sharing	June 30, 2026

Activity 3: Native Skywatchers Citizen Science - Zooniverse Minnesota - Leaders in Environmental Stewardship

Activity Budget: $40,000

Activity Description:
The proposed project will deliver cutting-edge, networked technology where Minnesota students, citizen scientists and professional scientists can work together to label acoustic data for direct application to conserve protected species. We will build an online data analysis project called “Turtle Island Researchers” on the Zooniverse platform, where all Minnesotans can learn about and actively participate in this incredible research experience. Short clips of acoustic recordings and photographs will be uploaded into a custom citizen science platform (Zooniverse) so that participants can easily label the species and sounds that were present at the study site. Feedback from the community of users and stakeholders will be used to refine our approach to improve data quality and science learning. Educators from K-12 and informal education institutions will benefit.

We can significantly expand the return on investment for the millions of Minnesota taxpayer dollars spent on natural resource protection by creating a means of public access to scientific data and allowing the public to contribute to science in a valuable way. We will create pathways for collaboration between researchers, citizen scientists, and educators to participate in authentic research will ultimately lead to an improved STEM workforce required across all scientific and technological disciplines.

Activity Milestones:

Description	Approximate Completion Date
Collect acoustic and photographic data from two sites. (1)Voyageurs - rural; (2) Mississippi-urban	October 31, 2024
Create acoustic & photographic data workflows on Zooniverse website	January 31, 2025
Internal project review; modify based on reviewer feedback	June 30, 2025
Build and release the Beta version of “Turtle Island Researchers”	December 31, 2025
Formally launch “Turtle Island Researchers” on Zooniverse	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Christina Hausman Rhode	Voyageurs National Park Association	Collaborator	No
Ronald Willis	Giida Program - Fond du Lac	Collaborator	Yes
Ramona Kitto Stately	We are Still Here Minnesota	Collaborator	Yes
Angela Osuji	Educator - Washburn High School	Collaborator	Yes
Nancy Nair & Carmen Gavin Vanegas	Educators - All Nations Program, South High School	Collaborators	Yes
Anna Waugh	Mississippi Park Connection	Collaborator	No
Annette S. Lee	Native Skywatchers Design Studio	Data Visualization Lead	Yes
Gary Casper	Great Lakes Ecological Services	Collaborator/Advisor	Yes
Greg Geller	Independent Research & Field Biologist	Collaborator/Advisor	Yes
Thomas Parr	National Park Service - Great Lakes Inventory & Monitoring Network - Program Manager	Collaborator	No
Tawnya Schoewe	Voyageurs National Park - Partnership Coordinator, Program Manager for Resource Education & Visitor Services	Collaborator	No

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

Results of this work “Turtle Island Skywatchers -MN Research...” will be shared publicly on multiple websites such as NativeSkywatchers.org and our partner organizations, like Voyageurs National Park, Voyageurs Conservancy, and Zooniverse. Minnesota educators statewide will use our visual resources created and have students participate in the Native Skywatchers Citizen Science- Zooniverse Minnesota initiative.

Demand is extraordinary for this work. Additional funding was secured for student participation from the United Way-Career Academies (June 2023-2024). Also, funding from the Heising Simon Foundation supports We are Stardust and similar programming, so there is hope for expansion if this MN-based work is strong.

Project Manager and Organization Qualifications

Project Manager Name: Annette S. Lee

Job Title: Annette S. Lee, PhD, MFA - Founder & Director of Native Skywatchers

Provide description of the project manager’s qualifications to manage the proposed project.
Annette S. Lee, PhD, MFA, is an award-winning scientist, visual artist, science communicator, and civic engagement leader who leads social transformation work with Indigenous communities worldwide, especially Ojibwe and D(L)akota people on Turtle Island (North America) and Mni Sota Makoce (Minnesota). She has over three decades of experience in education as a teacher, university instructor, teacher educator, program administrator, professional visual artist, and researcher. Her passion is to work at the intersection of art, science, and culture. This work grounds her in wellness and social justice. Designed by Lee (2007), the Native Skywatchers initiative seeks to remember and revitalize Indigenous star and earth knowledge. The hope is to inspire all people to have a rekindling or deepening sense of awe and personal relationship with both the celestial and terrestrial.

For thirteen years Annette taught as a Full Professor of Astronomy and Physics at St. Cloud State University while also serving as Planetarium Director. Annette has done graduate research in geology, geophysics, hydrology, astrochemistry, mathematics, astrobiology, and astronomy. In addition, she has taught college-level: geography, computer science, mathematics, anthropology, science education, math education, and astronomy.

More than a decade ago Annette lead a map-making project that created two innovative Indigenous star maps (Ojibwe and Dakota) that have been widely published. This collaboratively produced work led to two additional maps from the Greek and Ininew perspectives. Current work in animation, scientific visualization, and immersive sound art is in high demand and well-received internationally. In June 2023 Annette will receive a sixth college degree; an Honorary Degree (D.Sc) from McMaster University for her professional achievements. Annette’s innovative and culturally responsive work creates long-lasting replicable approaches to engaging underserved populations in science and for working collaboratively with native communities, educators, and museums to increase access and share best practices in STEM.

Organization: Native Skywatchers Inc

Organization Description:
Designed by Lee (2007), the Native Skywatchers initiative seeks to remember and revitalize Indigenous star and earth knowledge. The overarching goal of Native Skywatchers is to communicate the knowledge that Indigenous people traditionally practiced a sustainable way of living and sustainable engineering through a living and participatory relationship with the above and below, sky and earth. Additional outcomes include designing STEM pathways for Indigenous students and community wellness. The core framework for the Native Skywatchers initiative is rooted in a teaching called ‘Two-Eyed Seeing’ or Etuaptmumk as explained by Mi ‘kmaq elders:

"Two-Eyed Seeing is learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and to use both these eyes for the benefit of all. (Bartlett, Marshall, and Marshall 2012, 336)"

Two significant native star maps were created by A. Lee and team (2012) followed by additional classroom resources including educator workshops. In 2019, a short-term NASA grant was awarded to Native Skywatchers for one-year programming called “Two-Eyed Seeing: NASA & Indigenous Astronomy for the Benefit of All” which included seven cohorts, connecting students, Indigenous knowledge holders, and scientists.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Principal Investigator (PI)		Project lead & Manager			15%	0.5		$84,000
Researcher - Senior Investigator		Acoustic Ecology Research Lead			15%	0.28		$47,000
							Sub Total	**$131,000**
Contracts and Services								
TBD	Professional or Technical Service Contract	Field Biologist/Ecologist consultant				0.2		$8,000
TBD	Professional or Technical Service Contract	GIS and LiDAR consultant				0.2		$8,000
TBD	Professional or Technical Service Contract	Educator lead - Cohort 1 - Summer Stipend				0.2		$5,000
TBD	Professional or Technical Service Contract	Educator lead - Cohort 2 - Summer Stipend				0.2		$5,000
TBD	Professional or Technical Service Contract	Educator lead - Cohort 3 - - Summer Stipend				0.2		$5,000
TBD	Professional or Technical Service Contract	Indigenous Knowledge Holder collaborator				0.2		$5,000
TBD	Professional or Technical	Indigenous Knowledge Holder collaborator				0.2		$5,000

	Service Contract							
TBD	Professional or Technical Service Contract	Indigenous Knowledge Holder collaborator				0.2		$5,000
TBD	Professional or Technical Service Contract	Motion graphics and Animation consultant				0.2		$8,000
							Sub Total	**$54,000**
Equipment, Tools, and Supplies								
	Equipment	Audio Recording gear for research	Hydrophones, Zoom Hand pro, Microphones, etc.					$5,000
	Equipment	Visual Recording Gear for research	Camera for night sky & visual experience					$4,000
	Tools and Supplies	Other - Field Journals equipment	Scientific Illustration - Sketchbook (Canson 7x10"), Mechanical pencils (0.5mm), Water brush (Pentel medium), Watercolor Pocket Box (24 colors); Ink Pen (05 black)					$3,000
							Sub Total	**$12,000**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Cohorts travel to Research Sites, 3 cohorts per year	Travel stipends for schools					$2,500
							Sub Total	**$2,500**

Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Publication printing	Dissemination, conference handouts, tangible and visual communication of project					$250
	Printing	Printing/Copying	Still images of Data visualization, maps, visual graphics					$250
							Sub Total	**$500**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$200,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	United Way - Greater Twin Cities - Career Pathways	Purpose Driven Paychecks for student participants in Native Skywatchers learning ecosystem including Summer Camp 4n/5d at Voyageurs National Park-Native Skywatchers Teen Ambassador collaboration, Awarded for 2023, Start date of June 2023, one-year award. Will leverage partnership and network for potential funding in FY24.	Potential	$55,000
In-Kind	Minnesota State Arts Board	The current award is one year, June 2023 start date, "Turtle Island Skywatchers-A Night Sky Experience', arts focus for an experiential multi-sensory immersive large scale projection at Bell Science Museum likely premiere, May 2024	Potential	$30,000
			State Sub Total	**$85,000**
Non-State				
In-Kind	Voyageurs Conservancy	Award to Native Skywatchers from Voyageur Conservancy-Voyageur National Park - (42) Student Scholarship to attend Summer Camp as Teen Ambassadors plus Native Skywatchers Affiliates adult participation/guest speakers (6)	Pending	$50,000
In-Kind	Heising Simons Foundation	Current 3-year funding 2022 to 2026, allows for pre-set themes: "We are Stardust" and "Ocean Voices, Sea & Stars" learning cohorts. LCCMR funding would allow for expanded work focused on protecting, conserving, preserving and enhancing MINNESOTA'S air, water, land, fish, wildlife and other natural resources. This funding, if awarded "Turtle Island Researchers" would create an enhanced and parallel initiative that strengthen investment in Minnesota youth-education and would serve as a national model. Strong leverage of collaborative partnerships and efforts. Tremendous interest, demand, and momentum here.	Secured	$98,408
			Non State Sub Total	**$148,408**
			Funds Total	**$233,408**

Attachments

Required Attachments

Visual Component

File: a87bd7e5-799.pdf

Alternate Text for Visual Component

Visual examples-Native Skywatchers' & Collaborators' existing work CW from Top Left (1) Research A. Simonis; (2) G. Geller Youtube Turtle Sounds; (3) Native Skywatchers collaboration with Voyageurs National Park 2023; (4) Ojibwe & Dakota Star Maps featuring native constellations/MN wildlife 2012; (5) Map Art A.Lee 2021; (6)Research Geller&Casper...

Board Resolution or Letter

Title	File
Native Skywatchers Board Approved Resolution 3-28-23	9e59f91e-ea5.pdf

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
Letter of Support - Educator - Carmen Gavin Vanegas	ec74b2e6-4af.pdf
Letter of Support - Voyageurs Conservancy	c17093a6-925.pdf
Letter of Support - Mississippi Park Connection - Anna Waugh, Director	91149952-bda.pdf
Letter of Support - Bell Museum - Natalie Kennedy, Director of Statewide Engagement	1fffbec4-e26.pdf
Letter of Support - Voyageurs National Park - Tawnya Schoewe	016a2c7b-934.pdf
Native Skywatchers Inc. - Financial Capacity - 2022 Financial Statement	6dc83aa4-d3d.pdf
Letter of Support - Researcher Anne Simonis	3b8722cf-18c.pdf
Letter of Support - Educator - Angela Osuji	ccf1b26f-34f.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

Yes

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

Yes

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

No

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing $10,000 or more?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services, as defined in Minnesota Statutes section 299C.61 Subd.7?

No